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AIR PROVING GROUND, EGLIN AIR FORCE BASE, FLA. (PROJECT NO. ATD/FCB/3)

EXPERIMENTAL TEST AND EVALUATION OF THE K-19 GYRO COMPUTING SIGHT IN F-86A AIRPLANE, SERIAL NO. 48-295 - AND APPENDIXES A THRU C

10 DEC'51 31PP PHOTOS, DIAGRS, GRAPHS

GUN SIGHTS, COMPUTING
GUN SIGHTS, GYROSCOPIC
GUN SIGHTS - PERFORMANCE

ORDNANCE AND ARMAMENT (22)
FIRE CONTROL (4)

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Security Information

ARMAMENT TEST DIVISION

ENGINEERING TEST REPORT

Air Proving Ground
Eglin Air Force Base
Florida

PROJECT NO. ATD/FCB/3

SUBJECT: Experimental Test and Evaluation of the K-19 Gyro Computing Sight in F-86A Airplane, Serial No. 48-295

DATE
10 December 1951

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HEADQUARTERS
ARMAMENT TEST DIVISION
EGLIN AFB, FLORIDA

10 December 1951

SUBJECT: Experimental Test and Evaluation of the K-19 Gyro Computing Sight Installed in F-86A Airplane Serial No. 48-295 Project No. ATD/FCB/3

TO: Commanding General
Wright Air Development Center
ATTN: Weapons Components Division
Wright-Patterson Air Force Base, Ohio

1. In accordance with letter from Commanding General, Air Materiel Command, Wright-Patterson Air Force Base, Ohio, dated 13 October 1950, subject: Request for Test; and in accordance with "Test Requirement and Manual Experimental Test of the K-19 Computing Sight Installed in F86A Airplane", dated 27 September 1950, from Armament Laboratory, Engineering Division, Air Materiel Command, the Subject Test has been conducted in part. A directive to terminate the test before its completion was received from the Commanding General, Wright Air Development Center, Wright-Patterson Air Force Base, Ohio, by teletype message WCEGF-8-2-E, dated 2 August 1951.

2. The K-19 Computing Sight is a disturbed reticle type sight employing a single gyroscope, with eddy current control, linked to the optical system. It was designed for use in aircraft with fixed, forward-firing guns.

3. The object of this test was to evaluate the performance of the Sight in tracking and ranging representative target aircraft, and to record the lead output of the Sight.

4. The results of this test indicate that:

a. The K-19 Sight is stable when utilized in F-86A type aircraft during non-firing, camera-tracking, pursuit attacks. Electrical caging provides the sight restraint required for target acquisition.

b. Good tracking can be accomplished with the Sight during non-firing, camera-tracking, pursuit attacks. The bias of aim wander (algebraic average of tracking error) is less than one mil.

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SUBJECT: Experimental Test and Evaluation of the K-19 Gyro Computing Sight Installed in F-86A Airplane Serial No. 48-295, Project No. AED/WC/3.

c. Manual ranging does not provide continuously the accuracy required for effective sighting. An average uncertainty in ranging of 800 feet was found for both left and right side attacks.

d. Pre-flight checks do not require the use of external test equipment and can be performed in ten minutes. The Sight imposes few maintenance problems.

5. It is concluded that:

The K-19 Sight is stable and is a good tracking device, but the provision for manual ranging is unsatisfactory.

W C Morse

W. C. MORSE
Colonel, USAF
Commanding

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EXPERIMENTAL TEST AND EVALUATION OF THE K-19 GYRO COMPUTING SIGHT INSTALLED IN F86-A AIRPLANE SERIAL NO. 48-295

1. GENERAL:

a. The K-19 Gyro Computing Sight installed in F-86A Airplane No. 48-295 is a modification of the Navy Mark XX Anti Aircraft Director. It was tested in support of the development of a replacement for the K-14 Gun Sight.

b. Authority for the test was received by letter from the Commanding General Wright Air Development Center, Wright-Patterson Air Force Base, Ohio, dated 13 October 1950, subject: Request for Test. See Appendix A. A directive to terminate the test before its completion was received from the Commanding General Wright Air Development Center, Wright-Patterson Air Force Base, Ohio, by teletype message WCEGF-8-2-E, dated 2 August 1951. See Appendix B.

c. The K-19 is a disturbed reticle type sight for use in aircraft with fixed, forward-firing guns. It employs a single gyroscope with eddy current control, located in the sight head, and linked mechanically to the optical system. It is equipped with a variable diameter reticle for optical ranging, an accelerometer for introducing gravity drop corrections, and with mechanical and electrical caging devices. It receives inputs of angular velocity of line of sight as measured by the gyroscope, acceleration from the accelerometer, and range and altitude as set in by the pilot. It offsets the line of sight through a total computed lead angle based upon these inputs and the assumption of flight on a lead pursuit course. With the gyroscope mechanically caged the Sight may be used as a fixed sight. Provisions are incorporated in the Sight for quick conversion from use with 0.50 Caliber M8 API ammunition to use with 20mm ammunition. Design is for operation at target range of 250 yards to 1500 yards and from sea level to 50,000 feet altitude.

2. OBJECT:

The object of this test is to evaluate the performance of the Sight in tracking and ranging representative target aircraft, and to record the lead output of the Sight.

3. METHOD OF CONDUCTING THE TEST:

a. Preliminary Phase

(1) Modification and/or Installations

(a) Several modifications were required upon receipt of the airplane to remove the following discrepancies and to effect proper operation of the Sight and accompanying instrumentation: The gun firing circuit was connected to the camera circuit, thus bypassing the Gun Safety Switch. The K-19 Sight was electrically caged at all times. A short circuit existed in the Altitude Control Box. Camera motors operated when the Master Camera Switch was closed. Subsequent to the elimination of these discrepancies the Sight was checked and re-calibrated by a factory representative to preclude any damage which might have resulted from improper installation.

(b) Four pneumatic gun chargers, two compressors, and the associated control circuits were installed by Armament Test Division personnel to facilitate charging the guns between passes while airborne in the air dispersion phase of the test. Installation of a compressor in the rear ammunition container on each side obviated ammunition storage for the two lower guns. Compressor mountings in the ammunition containers were modified to provide adequate overhead clearance for the compressor fans.

(2) Instrumentation

The instrumentation, installed at Wright-Patterson AFB, consisted of the following:

(a) A 16mm GSAP sight line camera to photograph the sight reticle and the target.

(b) A 35mm Type A modified camera to photograph the following instruments mounted in the photo observer box: attitude gyro, altimeter, directional gyro, accelerometer, airspeed indicator, counter, and clock with sweep second hand.

(c) A coordination counter mounted in the cockpit.

(d) Instrumentation control wiring was such that electrically uncaging the Sight caused both cameras to operate. Operation continued until the gun trigger switch was closed. After closing the trigger switch the cameras could not be operated until the Sight was caged and uncaged electrically by use of the caging switch. A two second overrun was provided in the sight camera to permit photography during gun firing. Counters in the photo observer box and cockpit were energized each time the Sight was uncaged electrically, thus providing a means of associating films from the two cameras with particular passes and missions by making reference to counter numbers. A camera intervalometer was connected in the photo observer camera circuit to coordinate the consumption of film in the photo observer and sight cameras.

(3) Personnel Training

All test team personnel were familiarized with the general theory of operation and the operating instructions for the Sight. The project engineer and airmen technicians also became familiar with sight maintenance practices, instrumentation components and wiring, and armament and power circuits for the F-86A Aircraft.

b. Main Phases

(1) Ground Firing Phase

(a) Problem: The problems of this phase were to boresight the guns, to harmonize the Sight and guns, to obtain basic gun fire dispersion data, and to observe the general behavior of the sight system and associated instrumentation during ground firing.

(b) Procedure: The airplane was placed on jacks at an attack angle of 12.4 mils, which was computed for an indicated air speed of 350 miles per hour at the altitude to be used in the subsequent air dispersion test, and boresighted and harmonized against a 1000-inch boresight target. Twenty color-identified rounds were fired from each of six guns. Inspection showed that bullets had struck the lower part of L2, L3, and R2 gun ports. Further experiment in boresighting and firing revealed that 10.3 mils was the maximum angle of attack that would allow proper boresighting and clearance of the gun ports without major modification of the gun mounts. Calculations showed that an angle of attack of 10.3 mils would be experienced under the following conditions: at 405 knots IAS, 405 feet altitude, 70 percent Ve Max; at 419 knots IAS, 10,000 feet altitude, 85 percent Ve Max; and at 405 knots IAS, 20,000 feet altitude, 100 percent Ve Max. To obtain proper clearance at gun ports, with a 10.3 mil angle of attack, it was necessary to place a lock washer, 1/8 inch thick, under the front mount of each gun. Boresighting and harmonization were accomplished with the plane at an attack angle of 10.3 mils. All guns were fired simultaneoulsy against a 1000-inch boresight target and a target at 300 yards. The Sight was uncaged and the Sight and sight camera were operated to detect effects of vibration during firing.

(c) Evaluation: The following factors were evaluated:

1. Gunfire dispersion.

2. Stability of Sight during ground firing.

3. Performance of sight line camera during ground firing.

(2) Camera Tracking Phase

(a) Problem: The problems of this phase were to determine by sightline camera data and test pilot interrogation the usefulness of the Sight in tracking and ranging representative aircraft, and to record the lead computed by the Sight.

(b) Procedure: Checks were made on the operation of the Sight and associated instrumentation, and instrument settings were made prior to each camera tracking mission. A combined total of 27 camera tracking and pilot orientation flights was accomplished. T-33, B-26, and B-29 type aircraft were utilized as targets. All target planes flew a straight and level course at altitudes varying from 10,000 feet to 20,000 feet and at a constant speed prescribed for each mission. The overtaking speed was held as closely as possible to 87 knots. Only one type of pass was used during a mission because of varying visibility and to avoid confusion on the part of the target aircraft pilot. Only right and left side pursuit passes from level and medium high were accomplished before project cancellation. The Sight was electrically caged and a sighter burst was made at the beginning of each sight film as a reference for film assessment. Manual ranging was employed throughout the attacks. The Sight was uncaged, and the sight camera and photo observer camera were put in operation at the initial point of attack. The partially silvered glass through which the pilot looked and which reflected the target and reticle images to the sight line camera was replaced by a smaller mirror after the pilot reported difficulty in seeing the target and reticle. The 35mm lens in the sight line camera was replaced by a 3-inch lens to obtain greater image size to facilitate data reduction.

(c) Evaluation: The following factors were evaluated:

1. Complexity of pre-flight inspection of the Sight and time required to accomplish this inspection.

2. Tracking stability of the Sight during pursuit attack.

3. Operation of the manual ranging system.

(3) Air-To-Ground Firing Phase

This phase was not conducted due to termination of the test.

(4) Target Gunnery, Air-To-Air Phase

This phase was not conducted due to termination of the test.

4. RESULTS OF TESTS AND DISCUSSION:

a. Ground Firing Phase

(1) A graph showing the radial dispersion for each gun is shown on page 6. Analysis of data obtained from the 300-yard target indicated that when allowances were made for trajectory the dispersion was comparable to the dispersion found on the 1000-inch target. Since the Air-to-Ground Firing Phase and the Air-to-Air Gunnery Phase of the test were not conducted, and it was therefore impossible to compare the dispersions of these phases with ground fire dispersion, no great significance is placed upon the results of ground firing. A technical order modification on the gun mounts would have required re-boresighting had the Air-to-Ground Firing and Air-to-Air Firing Phases been conducted. Due to project cancellation this was not done. It is, therefore, not known whether the modification would have enabled the accomplishment of boresighting with an angle of attack of 12.4 mils which was required for an indicated air speed of 350 miles per hour.

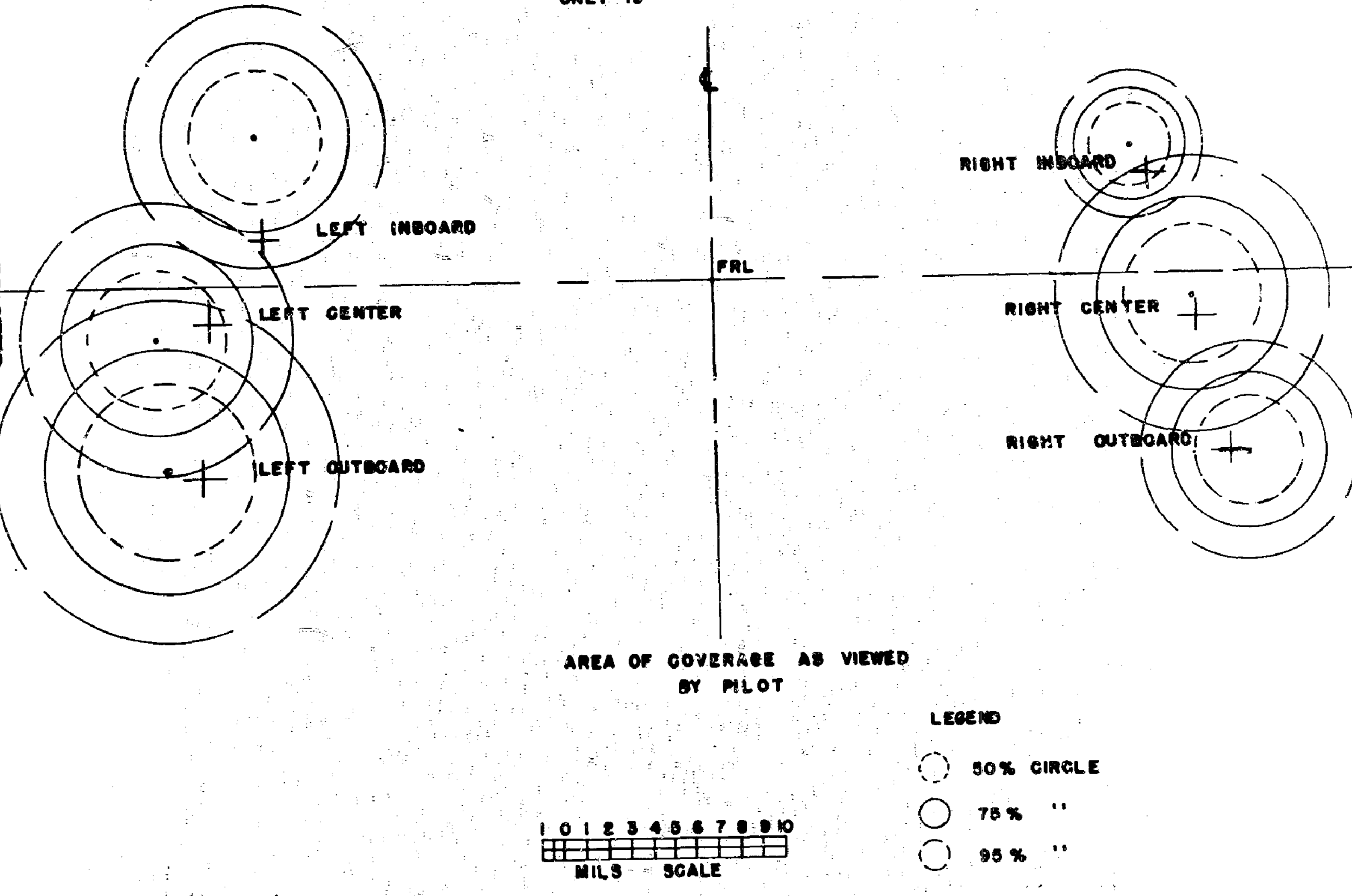
(2) Visual observation showed the sight reticle image to be very unstable when the guns were fired with the Sight uncaged. The center dot appeared to be twice normal size and dots in the reticle circle appeared to be in two places. Vibration of the Sight and attached sight camera was so pronounced that photographic results were not readable. The vibration induced in the Sight by ground firing would definitely impair sighting, but it is believed this effect would be minimized when the aircraft is buoyed in the air.

BORESIGHT DISPERSION GRA H

FCS-5 K-19C GYRO COMP
F-86 NO. 48-293
DATE FIRED: 21 MARCH 51
RANGE: 1000"
CONDITION: SIX CALIBER .50

M 3 MACHINE GUN FIRING M 8 API
20 ROUND BURSTS SIMULTANEOUSLY

NOTE: ONLY 18 ROUNDS FROM RIGHT INBOARD
ONLY 19 " " " CENTER



b. Camera Tracking Phase:

(1) Data was assessed from a total of eleven passes made against the T-33 aircraft in five missions. Failure to obtain assessable data from other missions was due to factors such as failure of aircraft during flight, damaged film, instrumentation failure, failure to uncage Sight, and limited field of view against B-26 and B-29 aircraft due to installation of the 3-inch lens.

(2) Readings of the flight instruments recorded by the photo observer camera were taken at every alternate frame and averaged for each complete pass. However some of the recorded information could not be used because of excessive instrument lag. This was particularly true of the attitude gyro and directional gyro information, therefore, only the readings from the altimeter, G-meter, and airspeed indicator are included in the tracking and ranging data shown on page 8.

(3) Tracking information in horizontal and vertical components (with respect to a coordinate system fixed to the attack aircraft) was determined by measuring from the vulnerable point of the target (intersection of wing span and fuselage lines) to the sight pip. This information was based on all assessable film data for each pass. The data thus obtained is presented in tabular form on page 8 and by graphs appearing on pages 9 through 19. While the standard deviation of tracking error seems high, it should be noted that all of the assessable film data was used in determining these values. For the sixteen recorded passes the bias of aim wander (algebraic average of tracking error) was approximately zero. The lateral bias of aim wander ($\bar{x}$) ranged from + 4 to -3 mils with eight of the passes recorded at zero mils. The vertical bias of aim wander ($\bar{y}$) ranged from + 3 to -5 mils with five passes recorded at zero mils.

(4) Lead as computed by the Sight was measured from the film in horizontal, vertical, and radial components from the boresight to the sight pip. Again the coordinate system was with respect to the attack aircraft. Only the radial lead was plotted. See graphs on pages 9 through 19. The radial lead curves would be expected to be smooth for good performance, as was the case with left side attacks. With the right side attacks, however, noticeable fluctuations occured. It was anticipated that there would be some correlation between the magnitude of the radial lead and accelerometer readings, however, no such correlation appears to exist. This was probably due to accelerometer lag and the short time for which lead was graphed.

TRACKING AND RANGING DATA, [illegible]-19 SIGHT

Average Photo Observer Readings					Tracking Error				Average Range Uncertainty In Feet
Pass	No.	Alt ft	IAS mph	G's	$\bar{x}$ mils	$\bar{y}$ mils	σx mils	σy mils	
348	2	10,660	477	2.4	0	0	3.83	3.16	-------
	4	10,860	499	2.3	0	-2	4.22	1.00	-------
	5	10,760	477	2.3	0	1	2.36	1.83	-------
349	2	11,770	477	1.5	1	-1	0.67	0.94	1000
	3	11,170	450	1.5	-1	0	1.30	1.40	-------
	4	10,870	387	2.5	0	1	3.03	3.08	500
351	1	15,860	459	3.3	-1	2	2.90	5.26	600
	2	16,280	438	2.7	0	-2	2.81	1.32	800
	3	16,460	431	2.5	1	0	1.63	3.59	900
	5	16,390	440	2.3	0	0	1.95	1.82	800
353	2	18,900	400	2.6	4	1	1.50	2.89	400
	5	18,790	353	3.0	-3	3	3.70	3.20	1300
354	2	18,130	312	2.7	0	2	4.40	4.20	600
	4	18,060	318	2.8	-1	-5	4.20	4.90	900
	5	18,330	287	2.2	1	-1	3.40	2.00	-- --
	8	18,240	313	1.9	0	0	2.94	1.74	600

Notes:

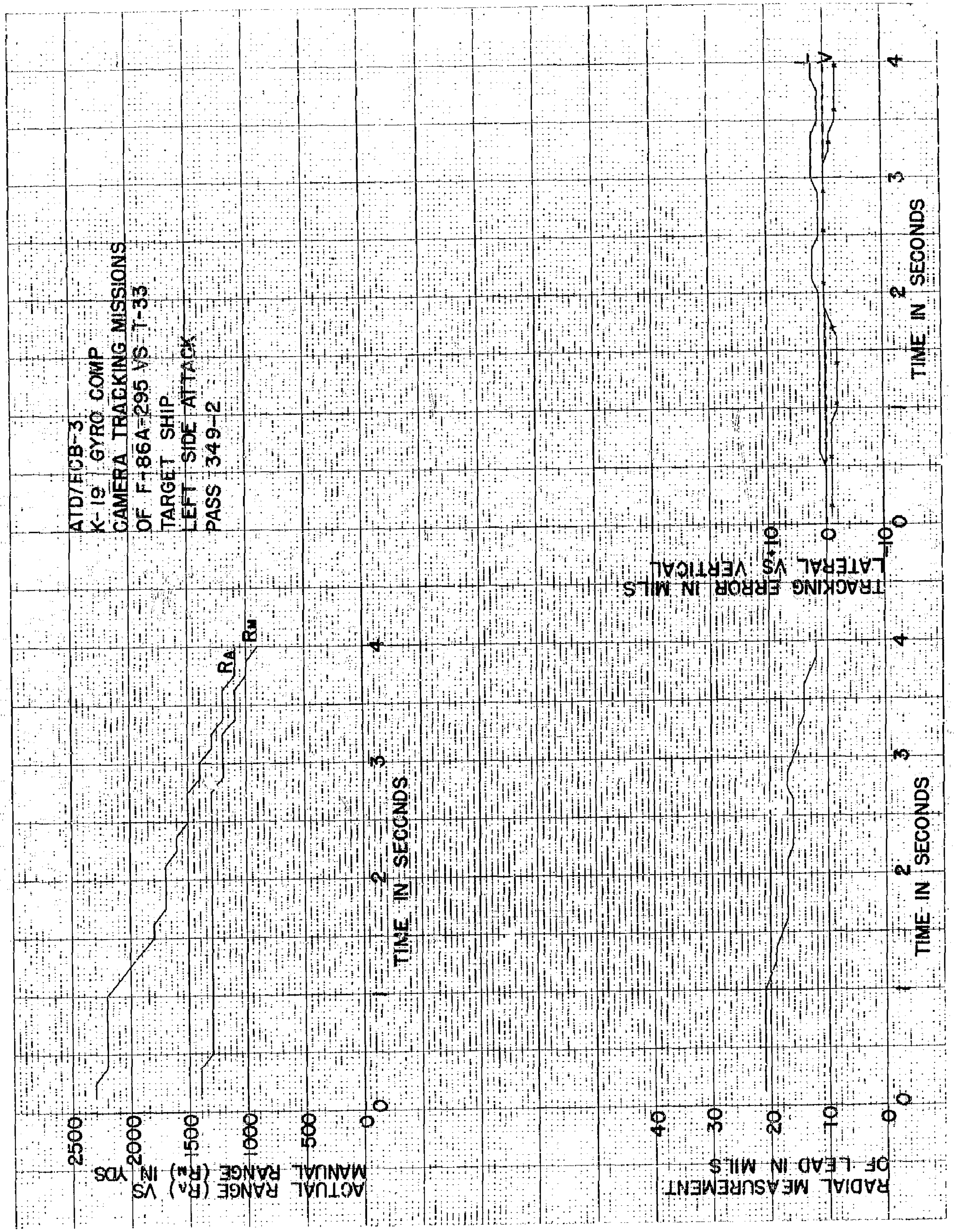
1. Range uncertainty is the difference between actual range and manual range.

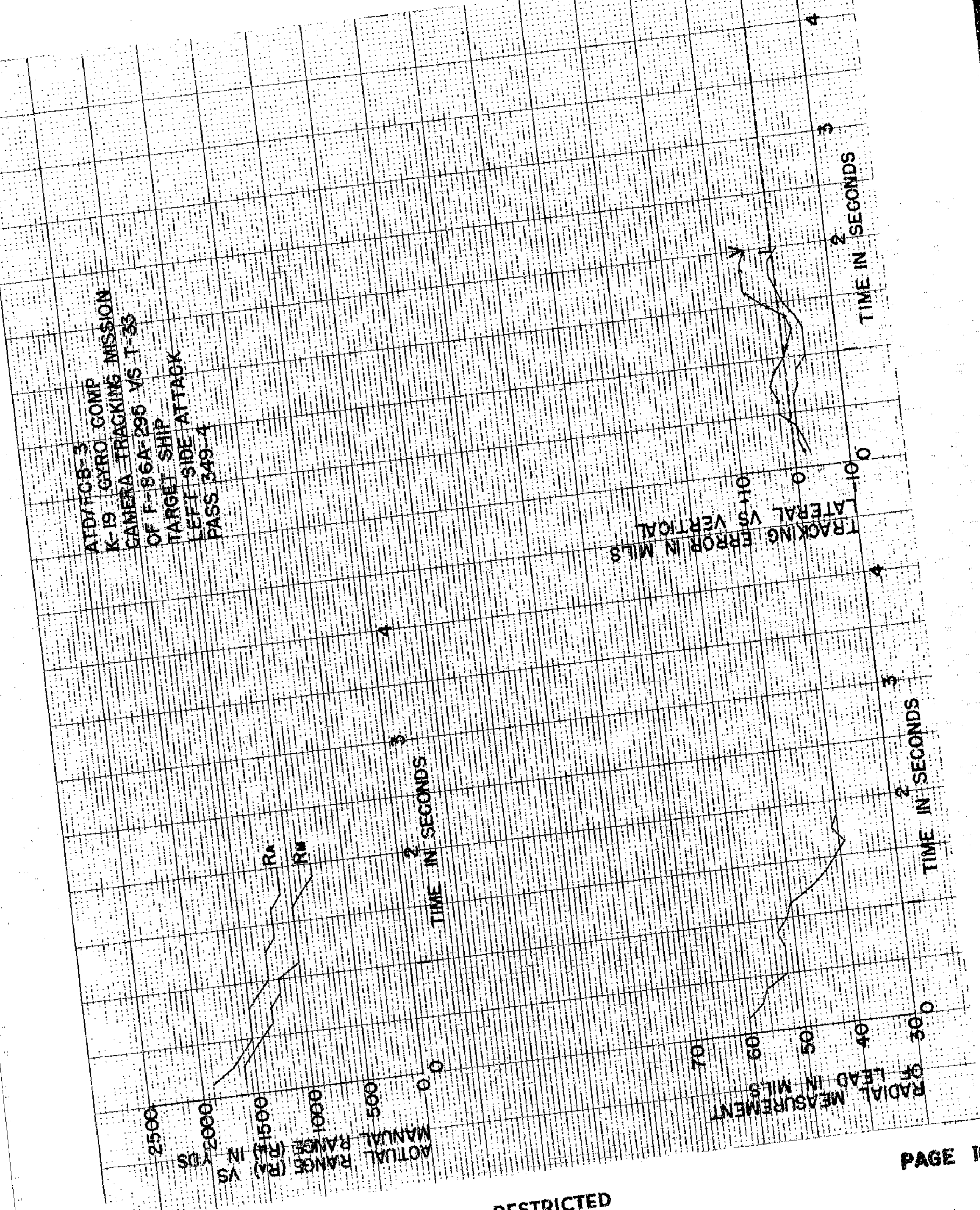
2. ------- indicates failure to obtain assessable data for calculating range uncertainty.

3. $\bar{x}$ and $\bar{y}$ indicate algebraic average of lateral tracking error and vertical tracking error, respectively.

4. σx and σy indicate standard deviation of lateral tracking error and vertical tracking error, respectively.

5. Overall average range uncertainty was 800 feet for left side and right side passes.


ATD/ECB-3
K-19 GYRO COMP
CAMERA TRACKING MISSIONS
OF F-86A-295 VS T-33
TARGET SHIP
LEFT SIDE ATTACK
PASS 349-2
ACTUAL RANGE (RA) VS
MANUAL RANGE (RM) IN YDS
RA
RM
TIME IN SECONDS
RADIAL MEASUREMENT
OF LEAD IN MILS
TRACKING ERROR IN MILS
LATERAL VS VERTICAL
TIME IN SECONDS
TIME IN SECONDS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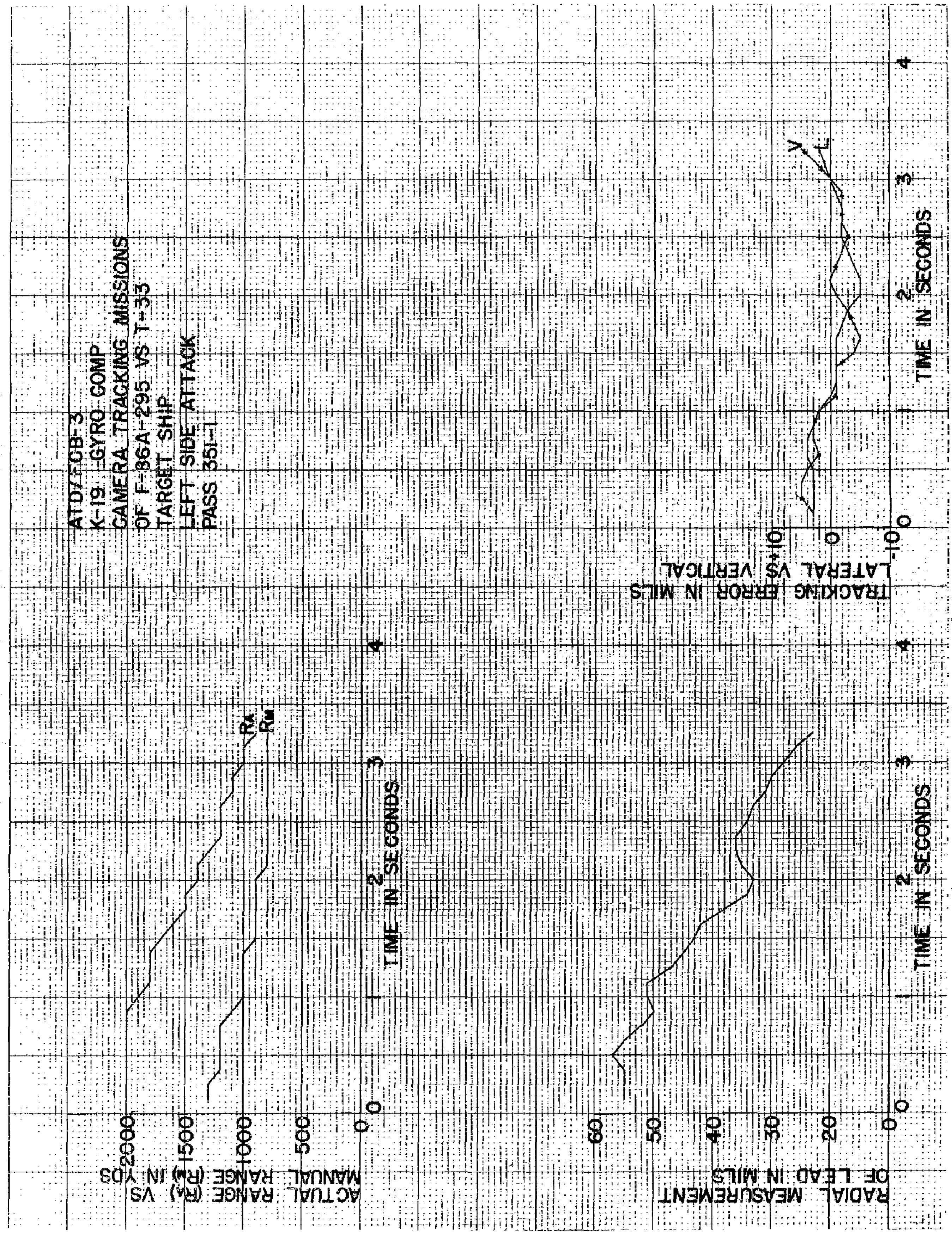
OF LEAD IN MILS
ACTUAL RANGE (Ra) VS
MANUAL RANGE (Rm) IN YDS
Ra
Rm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ACTUAL RANGE (RA) VS
MANUAL RANGE (RM) IN YDS
RA
RM
TIME IN SECONDS
RADIAL MEASUREMENT
OF LEAD IN MILS
TIME IN SECONDS
TRACKING ERROR IN MILS
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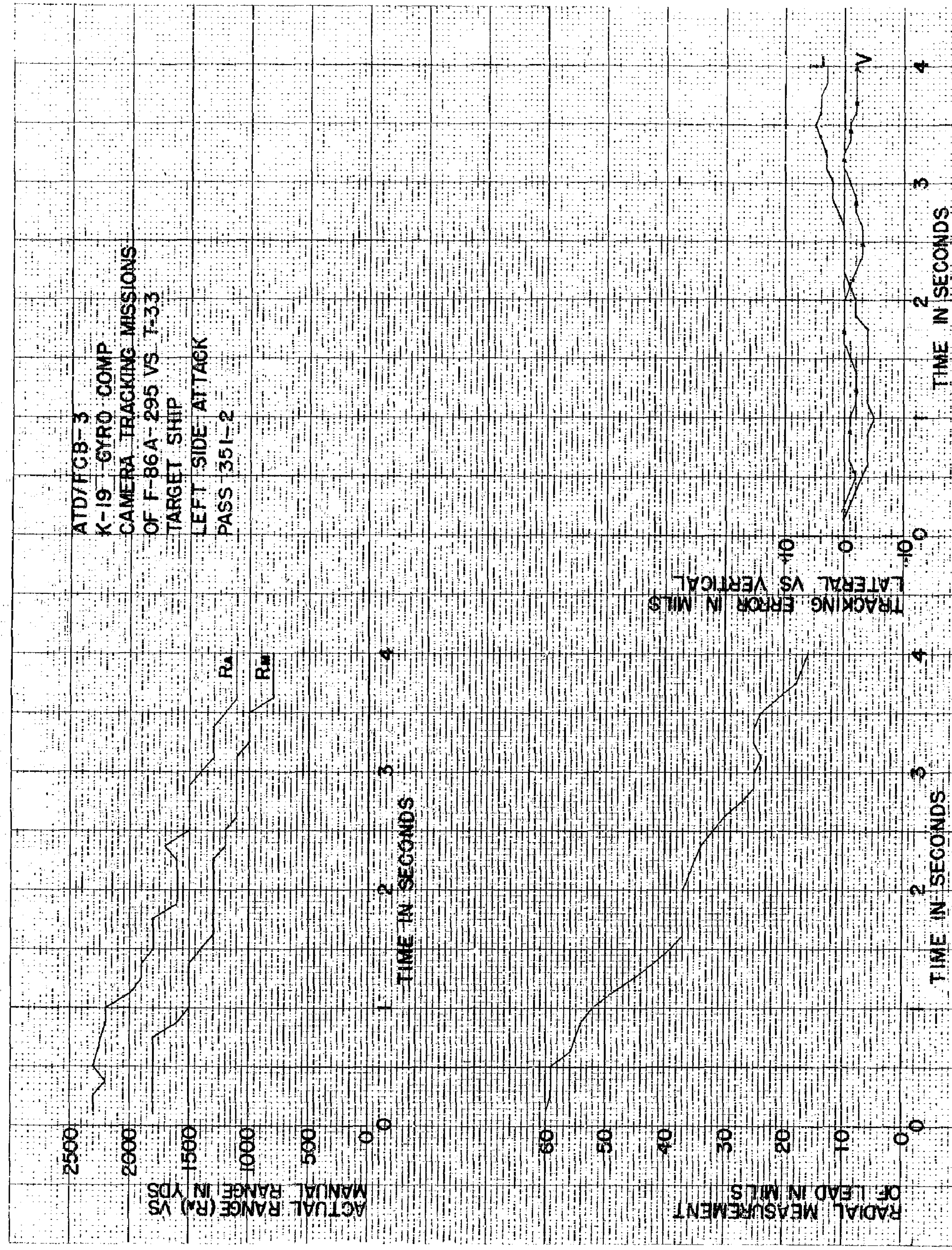
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OF F-86A-295 VS T-33
TARGET SHIP
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PASS 351-2
ACTUAL RANGE (RA) VS
MANUAL RANGE IN YDS
2500
2000
1500
1000
500
0
RA
RM
0
1
2
3
4
TIME IN SECONDS
RADIAL MEASUREMENT
OF LEAD IN MILS
60
50
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10
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TIME IN SECONDS
TRACKING ERROR IN MILS
LATERAL VS VERTICAL
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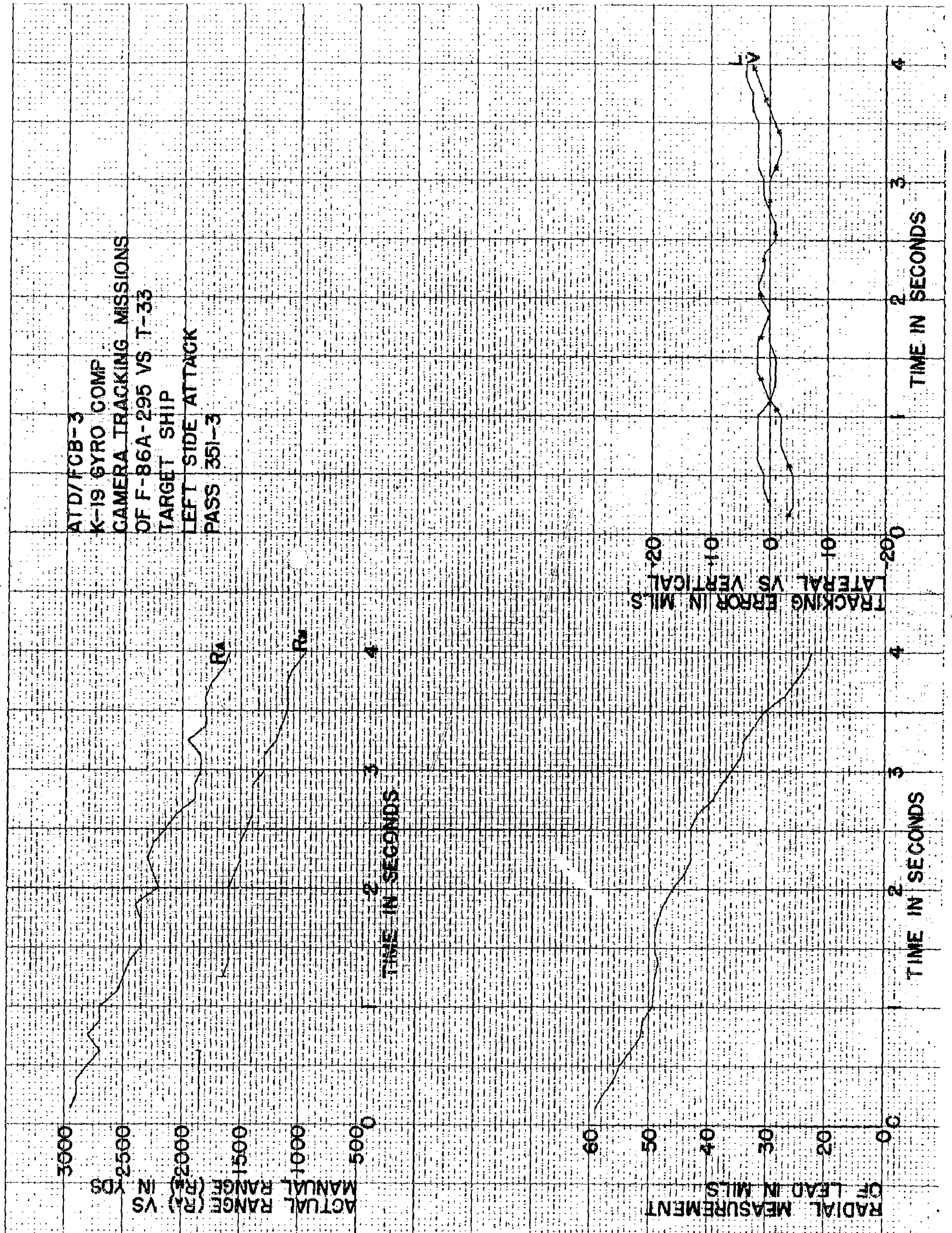
TIME IN SECONDS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OF LEAD IN MILS
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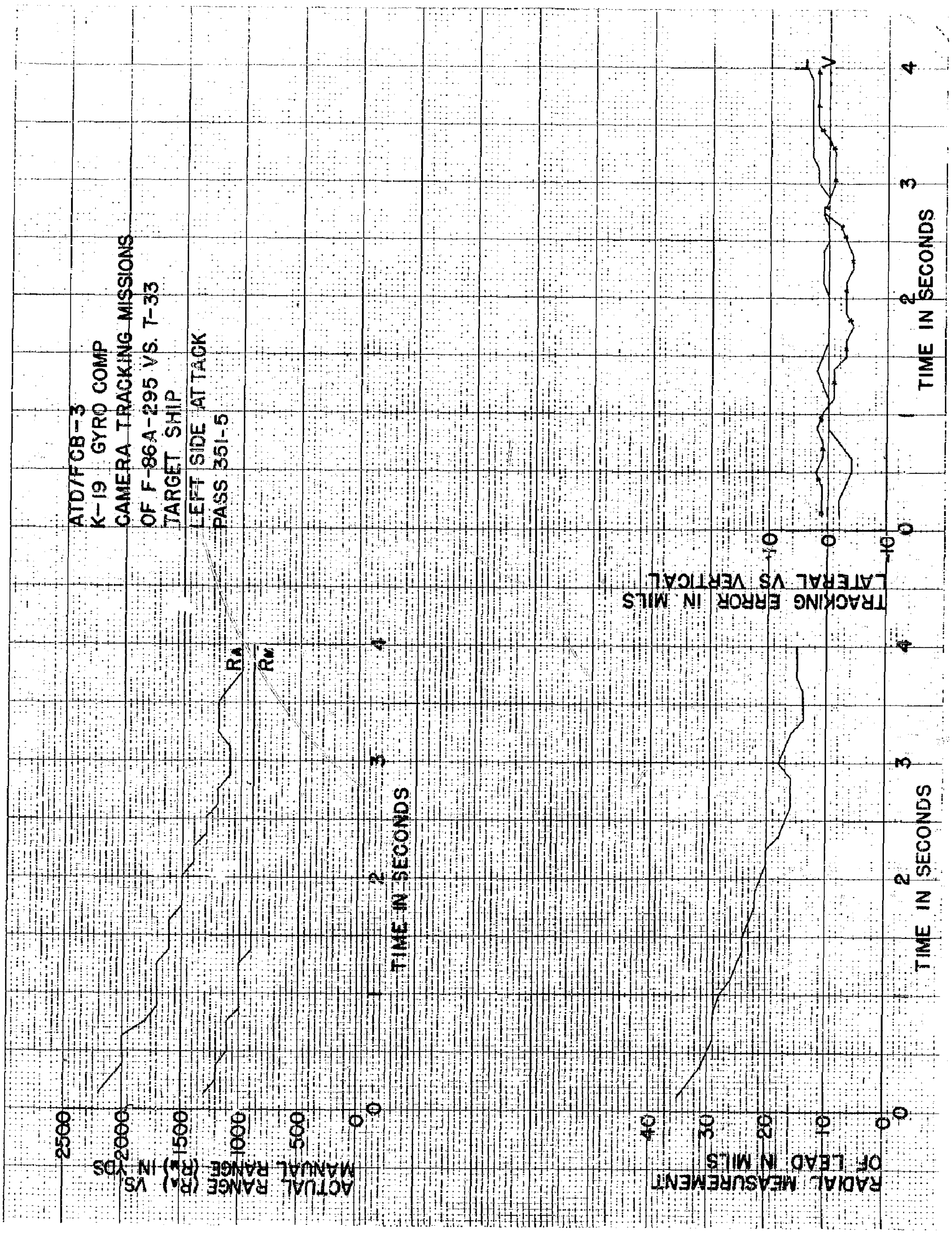
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RADIAL MEASUREMENT OF LEAD IN MILS
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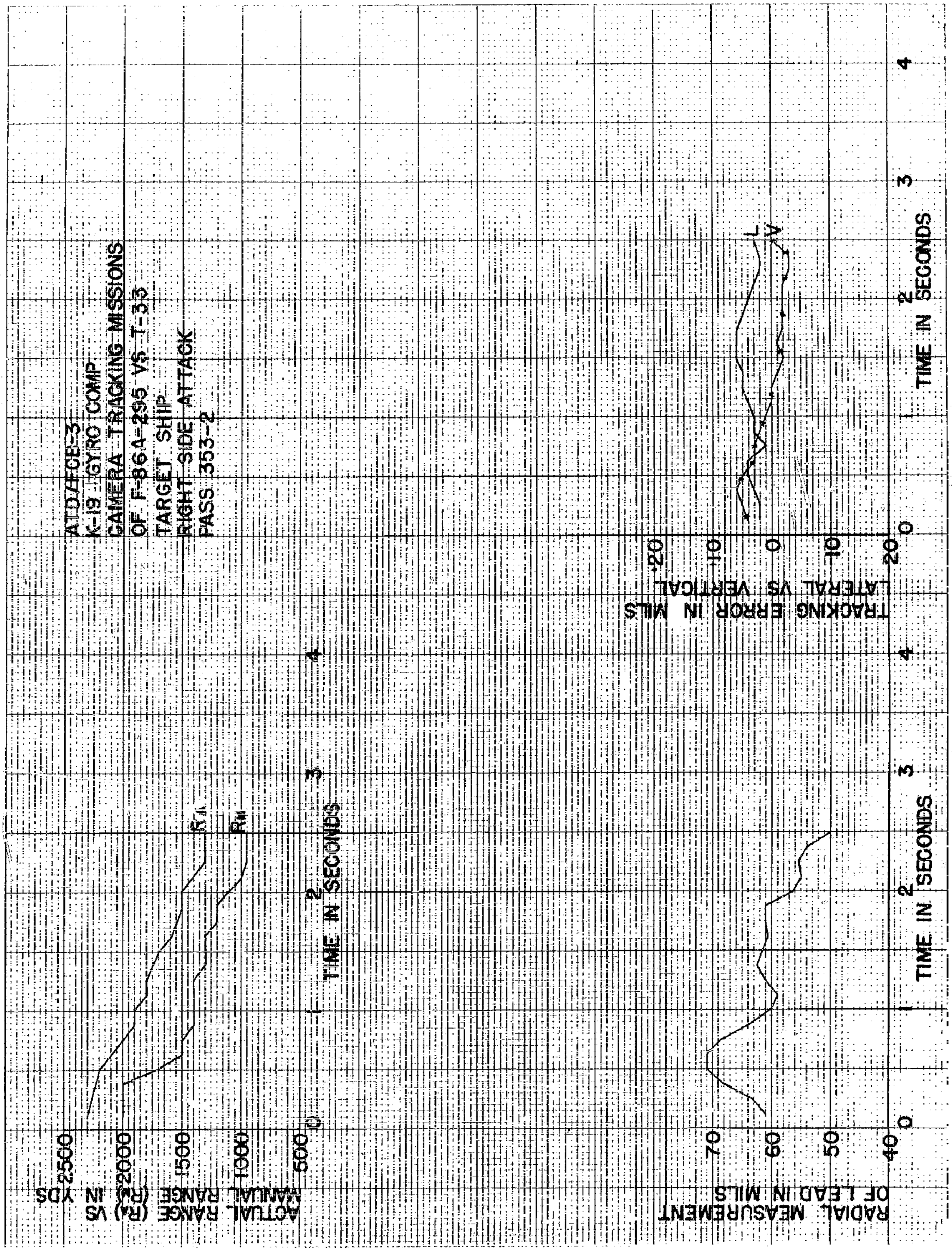
TIME IN SECONDS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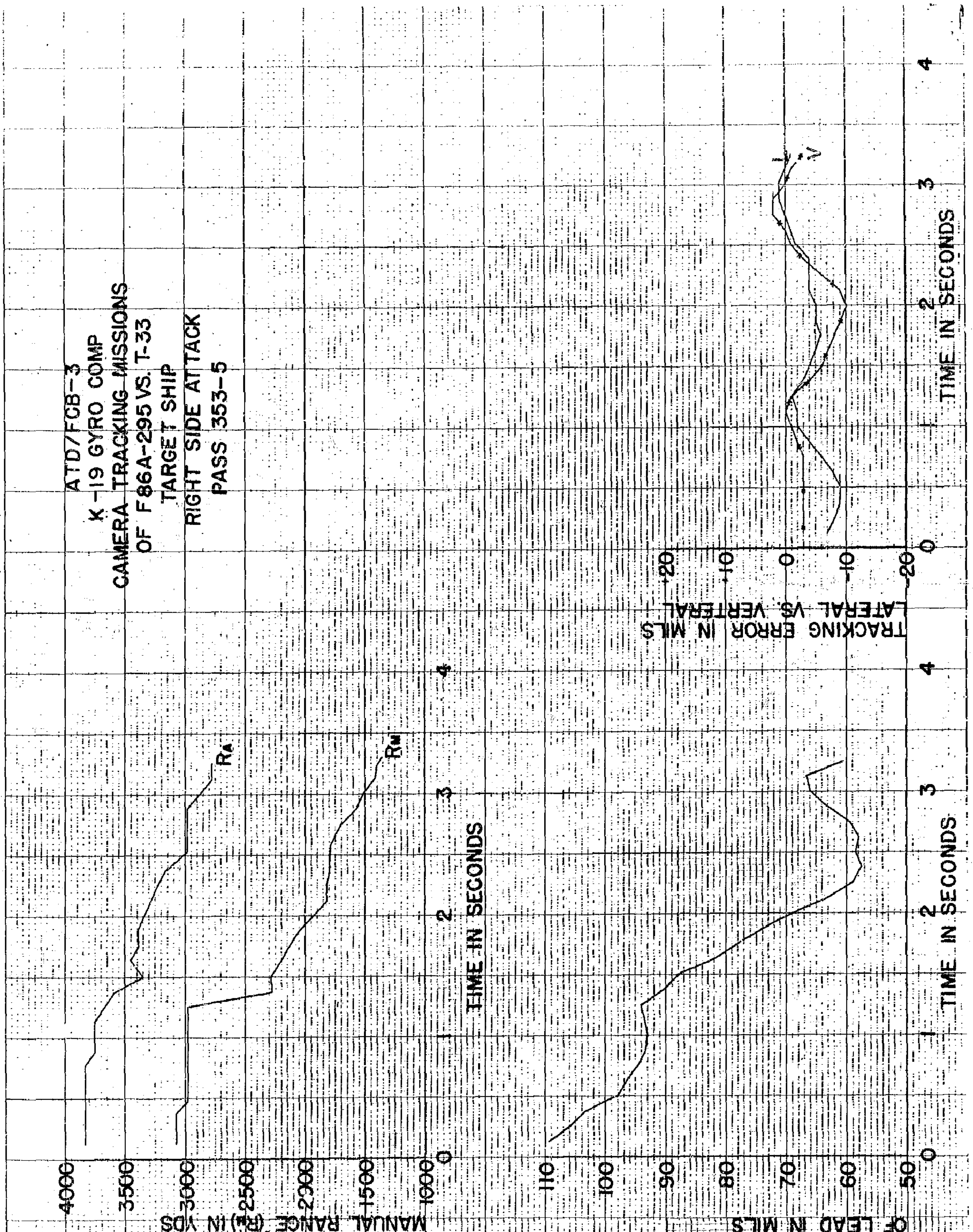
ACTUAL RANGE (RA) VS
MANUAL RANGE (RM) IN YDS
TIME IN SECONDS
RADIAL MEASUREMENT
OF LEAD IN MILS
TIME IN SECONDS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TARGET SHIP
RIGHT SIDE ATTACK
PASS 353-5
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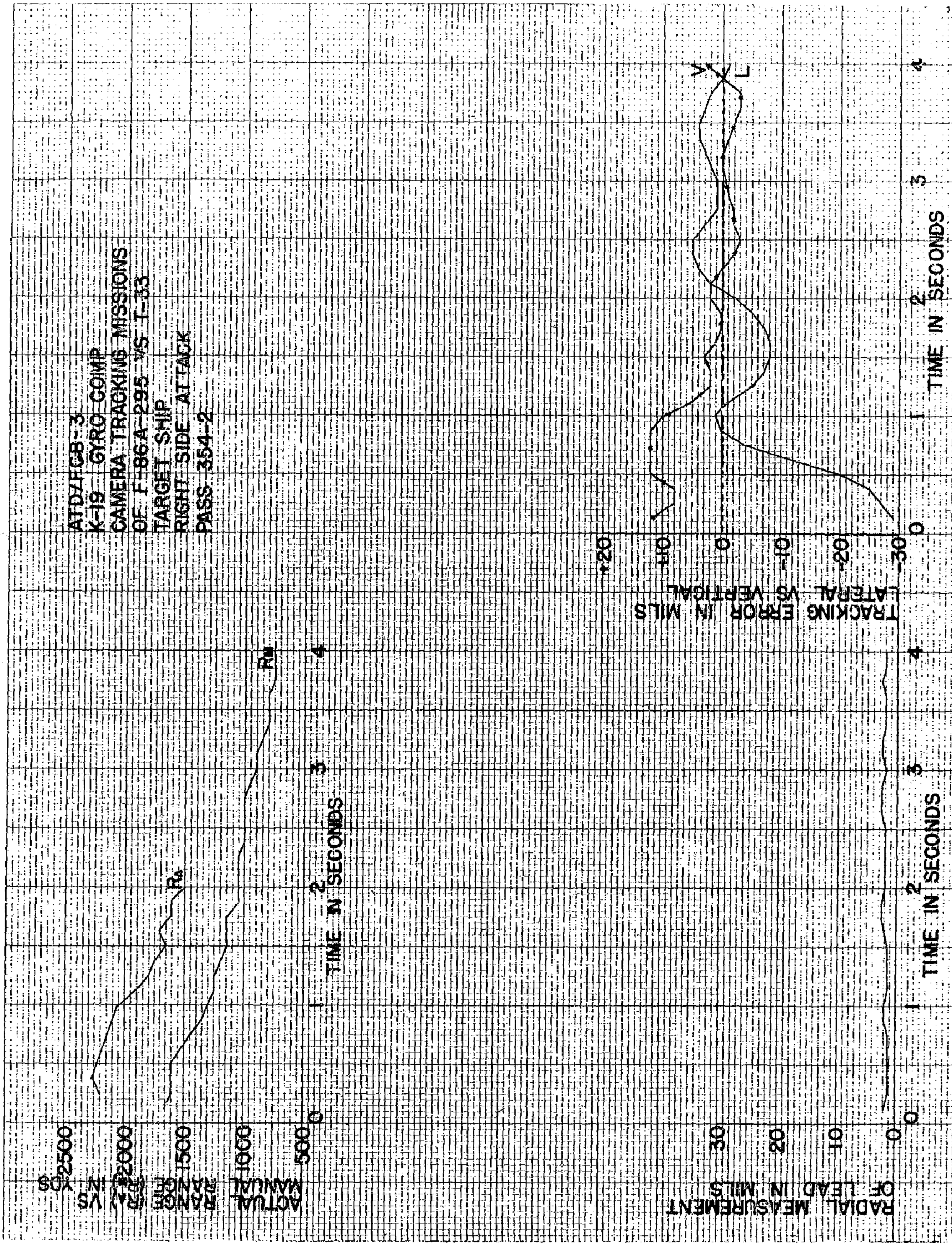
MANUAL RANGE (RM) IN YDS
RADIAL MEASUREMENT
OF LEAD IN MILS
TRACKING ERROR IN MILS
LATERAL VS. VERTERAL
TIME IN SECONDS
TIME IN SECONDS
TIME IN SECONDS
RA
RM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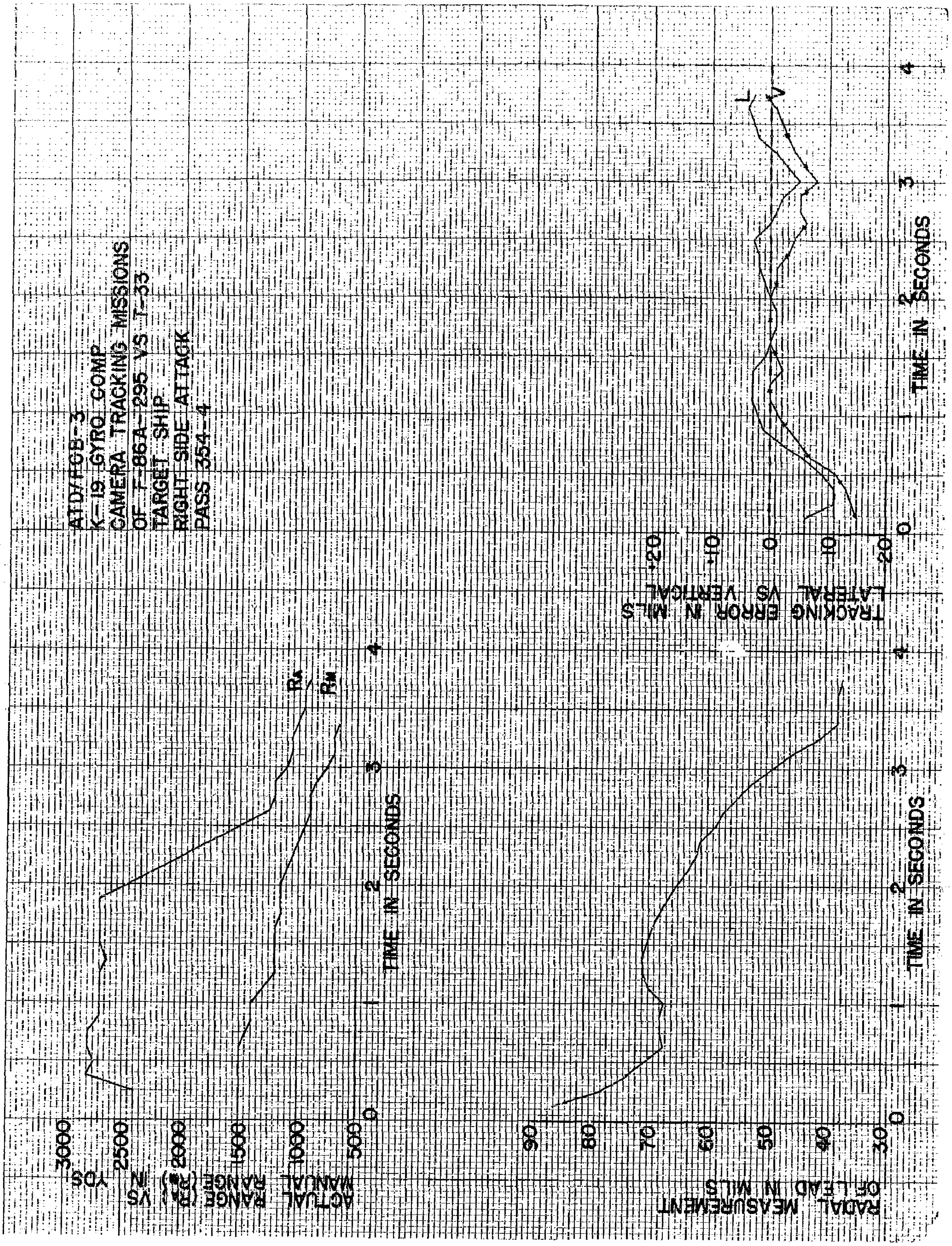
OF F-86A-295 VS T-33
TARGET SHIP
RIGHT SIDE ATTACK
PASS 354-2
ACTUAL RANGE (RA) VS MANUAL RANGE (RM) IN YDS
RADIAL MEASUREMENT OF LEAD IN MILS
TRACKING ERROR IN MILS LATERAL VS VERTICAL
TIME IN SECONDS
TIME IN SECONDS
TIME IN SECONDS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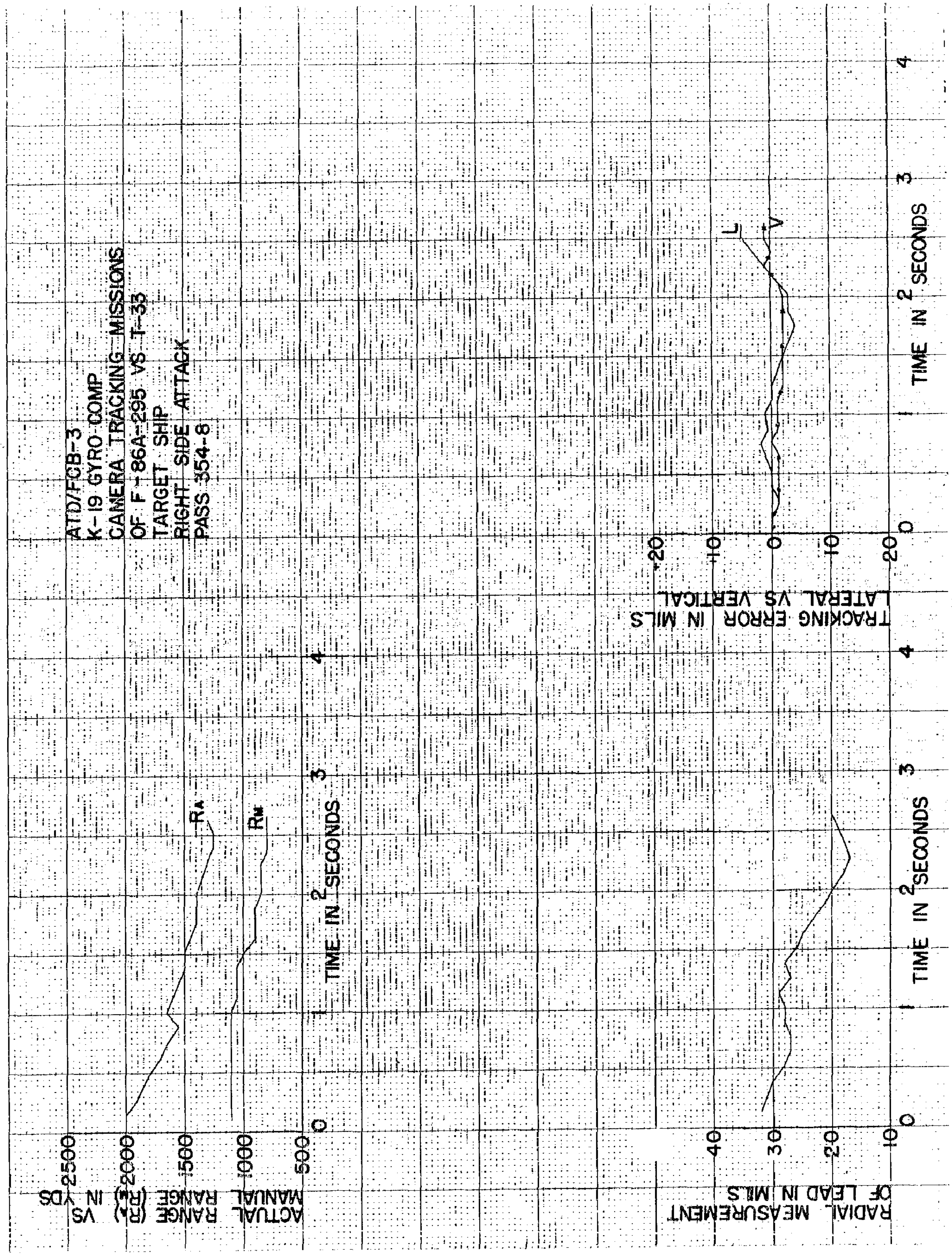
TARGET SHIP
RIGHT SIDE ATTACK
PASS 354-4
ACTUAL RANGE (Ra) VS MANUAL RANGE (Rm) IN YDS
TIME IN SECONDS
RADIAL MEASUREMENT OF LEAD IN MILS
TIME IN SECONDS
TRACKING ERROR IN MILS LATERAL VS VERTICAL
TIME IN SECONDS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TARGET SHIP
RIGHT SIDE ATTACK
PASS 354-8
ACTUAL RANGE (RA) VS
MANUAL RANGE (RM) IN YDS
RA
RM
TIME IN SECONDS
RADIAL MEASUREMENT
OF LEAD IN MILS
TIME IN SECONDS
TRACKING ERROR IN MILS
LATERAL VS VERTICAL
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TIME IN SECONDS

(5) Uncertainty of ranging is construed to be the difference between the actual and the manual range. The average range uncertainty is shown on page 8. Actual uncertainty of range during passes is shown by graphing actual and manual range versus time. See pages 9 through 19. Values shown for actual range do not make allowances for an assessment error of approximately ten per cent in actual range. Generally, uncertainty of ranging decreases with time, or closing range. Quite noticeable fluctuations occur in most of the curves. The last second before break away shows an uncertainty of ranging from 100 to 600 feet. An average range uncertainty of 800 feet was found for both left and right side attacks. Manual range was less than actual range during all passes. There was no conclusive difference between ranging during left side and right side attacks.

(6) Analysis of sight camera films showed the sight reticle to be free from oscillation and vibration during the tracking runs. Electrical caging provided the sight restraint required for target acquisition.

(7) Pre-flight checks as prescribed by the manufacturer were regularly performed in less than ten minutes and did not require the use of external test equipment.

(8) The only maintenance, other than pre-flight checks, required by the Sight during twenty-seven familiarization and camera tracking missions was the replacement of a vacuum tube in the power supply, the repair of a broken wire in the electrical caging circuit external to the sight head, and the replacement of the dessicant in the sight head.

5. CONCLUSIONS:

The K-19 Sight is stable and is a good tracking device, but the provision for manual ranging is unsatisfactory.

W. C. MORSE
Colonel, USAF
Commanding

MCREO

MCREC(MCREXO5) EM/jk
13 October 1950

SUBJECT: Request for Test

TO: Commanding General
Air Materiel Armament Test Center
ATTN: Chief of Plans and Operations
Eglin Air Force Base, Florida

1. It is requested that an experimental test and evaluation of the "K-19 Gyro Computing Sight" installed in F86A airplane serial No. 48-295 be performed. The equipment, the airplane, test programs, raw data, interim reports and final reports are classified "Restricted". The AMC priority for the project is 1-B. The test is to be performed under Engineering Division Expenditure Order No. 554-322, MX 952. The test program will be initiated approximately 16 October 1950 and will require an estimated 90 days for completion.

2. The Type K-19 Gun Sight is a gyro computing sight with reflex optics for use in the control of fixed guns when mounted in high speed jet propelled aircraft. It consists of an integral sighting head and computer unit, with associated power source and controls. Ranging is accomplished manually. This sight is a modification of the Navy Mark XX Anti-Aircraft Director. It is anticipated that this new sight will provide improved sighting accuracy over the present K-14B Gun Sight. The detailed test procedure should be prepared by AMATC with reference to the test program contained in the inclosed test requirements and manual. The Test Program is subdivided into four tests: Ground Preparation which includes harmonization, ground dispersion on 1000 inch target and ease of ground handling; Air Dispersion Test to obtain the disperison pattern of the aircraft-gun-combination; Camera Test to determine the measured performance of sight and aircraft; and, Target Gunnery Test to obtain center of impact data for determination of figure of merit for the performance of the system. Accurate detailed test data, including center of impact, per cent of hits on a standard tow target, dispersion of projectiles, and firing conditions i.e. range, altitudes, IAS, and angle off, will be required to properly evaluate the equipment.

3. The Project Engineer or other AMC representative will be available to aid in conducting test as necessary. The AMATC will provide personnel to fly and maintain test aircraft, and target aircraft, and personnel to maintain instrumentation and gather and analyse data. The

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SUBJECT: Request for Test

F86A airplane No. 48-295 with K-19 computing sight and photo observer, and B-26 tow-target aircraft number (44-34216) will be provided by Headquarters AMC. A spare sight can be provided in the event of failure of the first sight. The manufacturer claims that no maintenance should be necessary on the K-19 sight except for dessicant, reticle lamp, tubes and fuse replacements.

BY COMMAND OF LIEUTENANT GENERAL CHIDLAW:

1 Incl:
Test Reqs.
w/5 Incls.
(orig and
5 cys)

/s/ Floyd B. Wood
/t/ FLOYD B. WOOD
Colonel, USAF
Chief, Operations Office
Engineering Division

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GLO90Q
YVAI16
JEDWP E085
PP JESGL
DE JEDWP 20L
P 011715Z

FM CG WRIGHT AIR DEVELOPMENT CENTER WRIGHT PATTERSON AFB OHIO
TO CG AIR PROVING GROUND EGLIN AIR FORCE BASE FLORIDA

AF GRNC

WCEGF-8-2-E FOR ARMAMENT TEST DIVISION 1ST IND DTD 13 JULY 51 FROM HQ USAF DIRECTS CANCELLATION OF TEST PROGRAM OF K-19 GUNSIGHT IN F-86 NO. 295. TRANSFER ARRANGEMENTS FOR AIRCRAFT WILL BE SUBJECT OF SEPARATE COMMUNICATION. ARMAMENT LABORATORY WADC

02/1454Z AUG JEDWP

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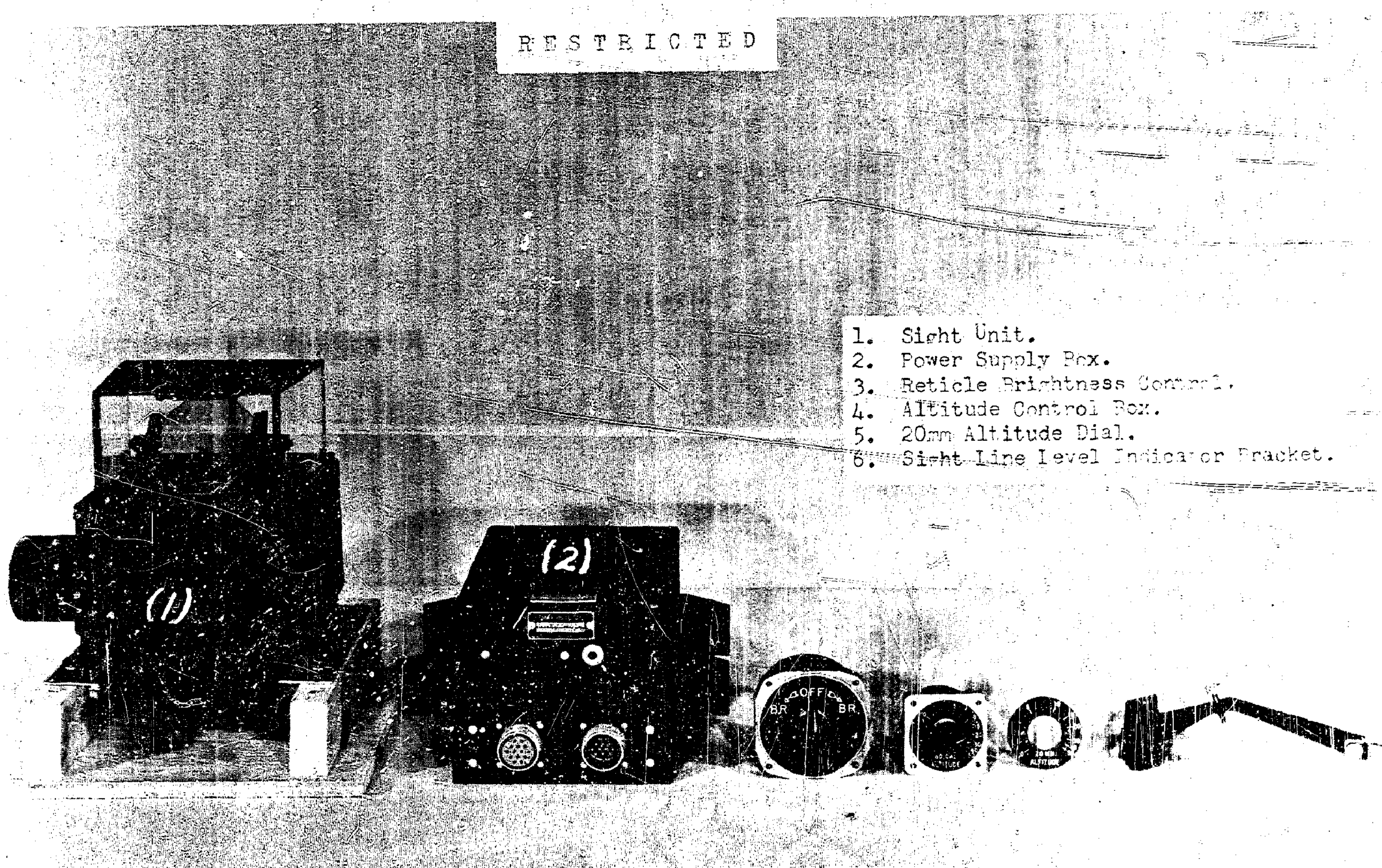
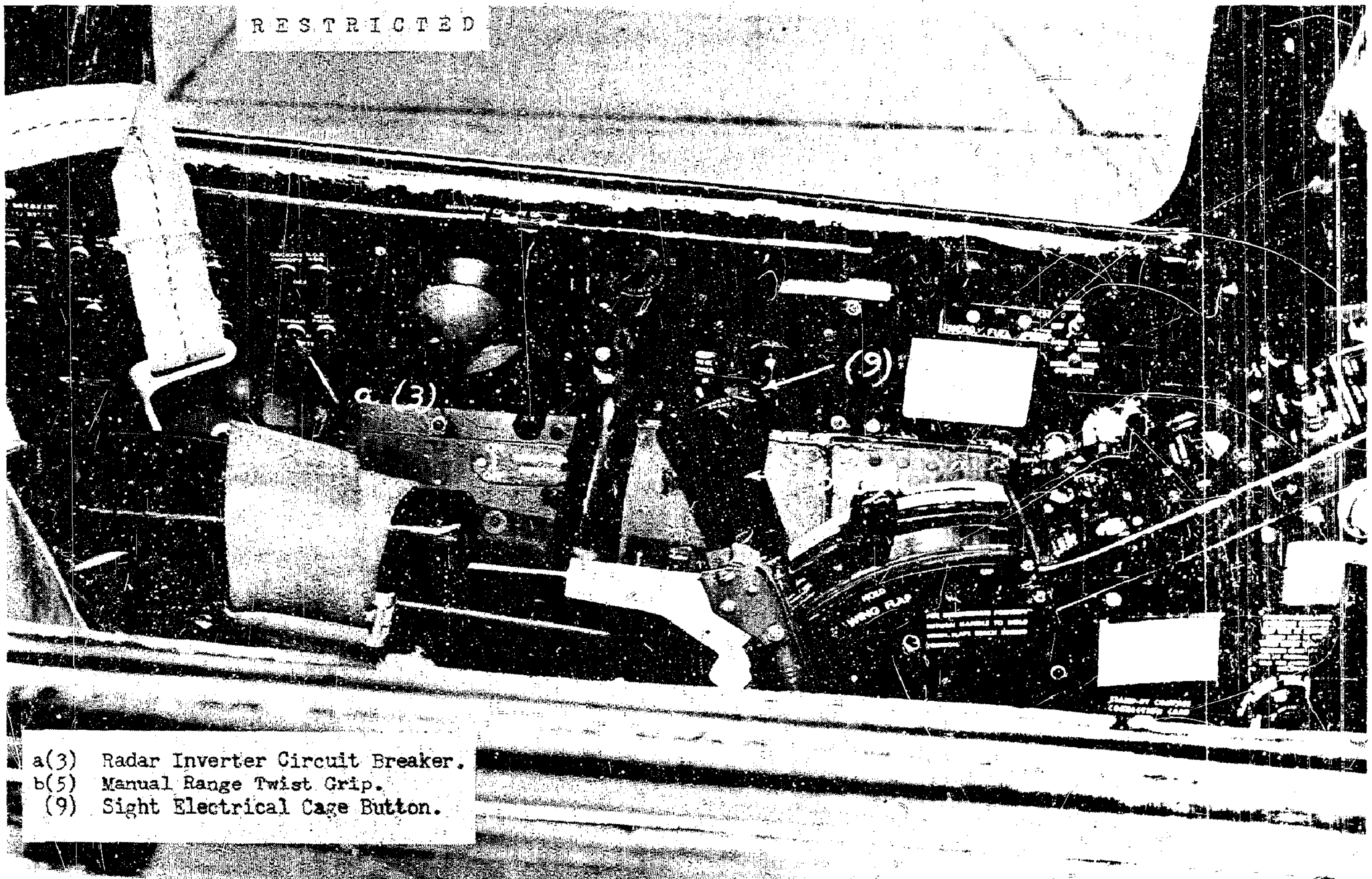
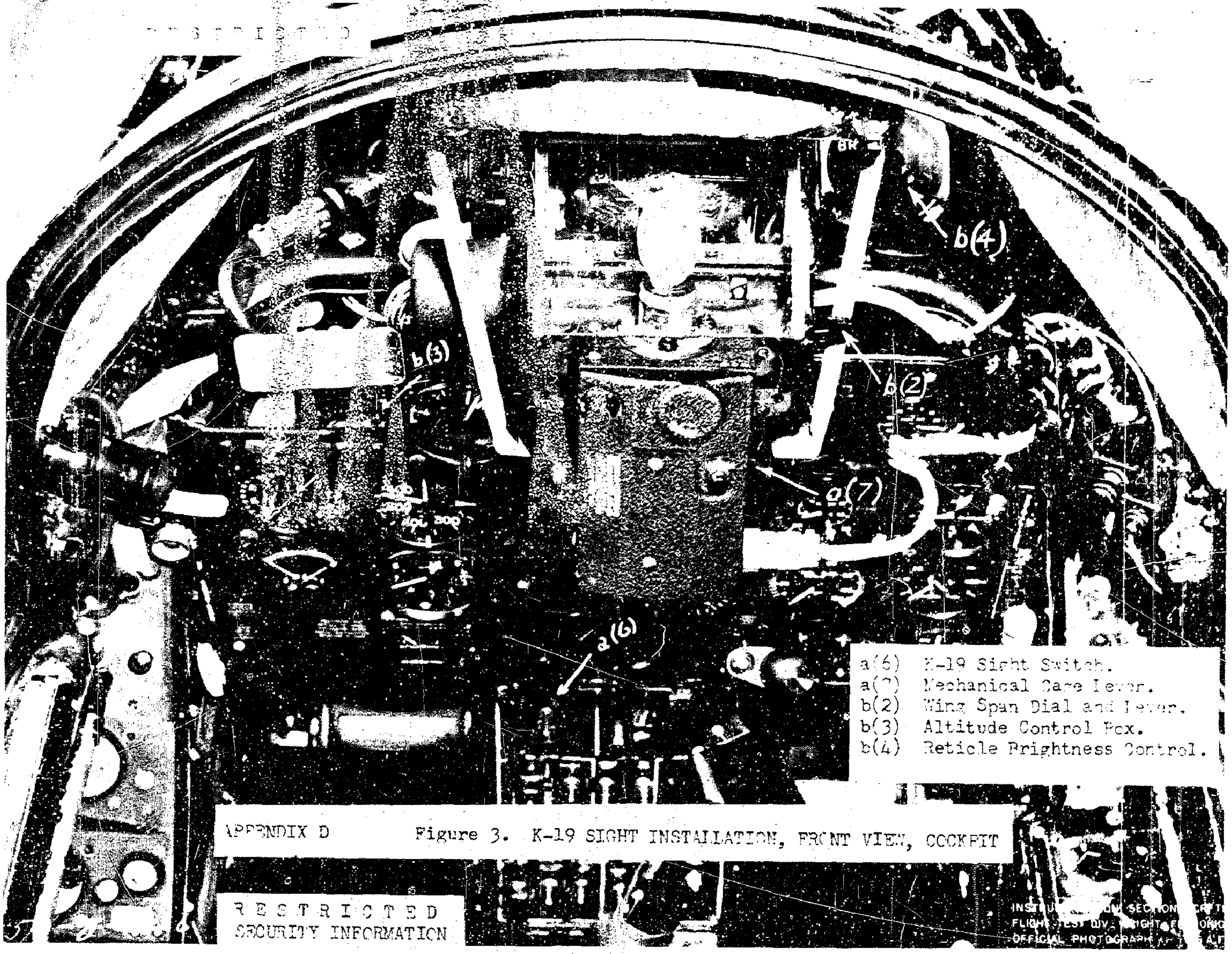


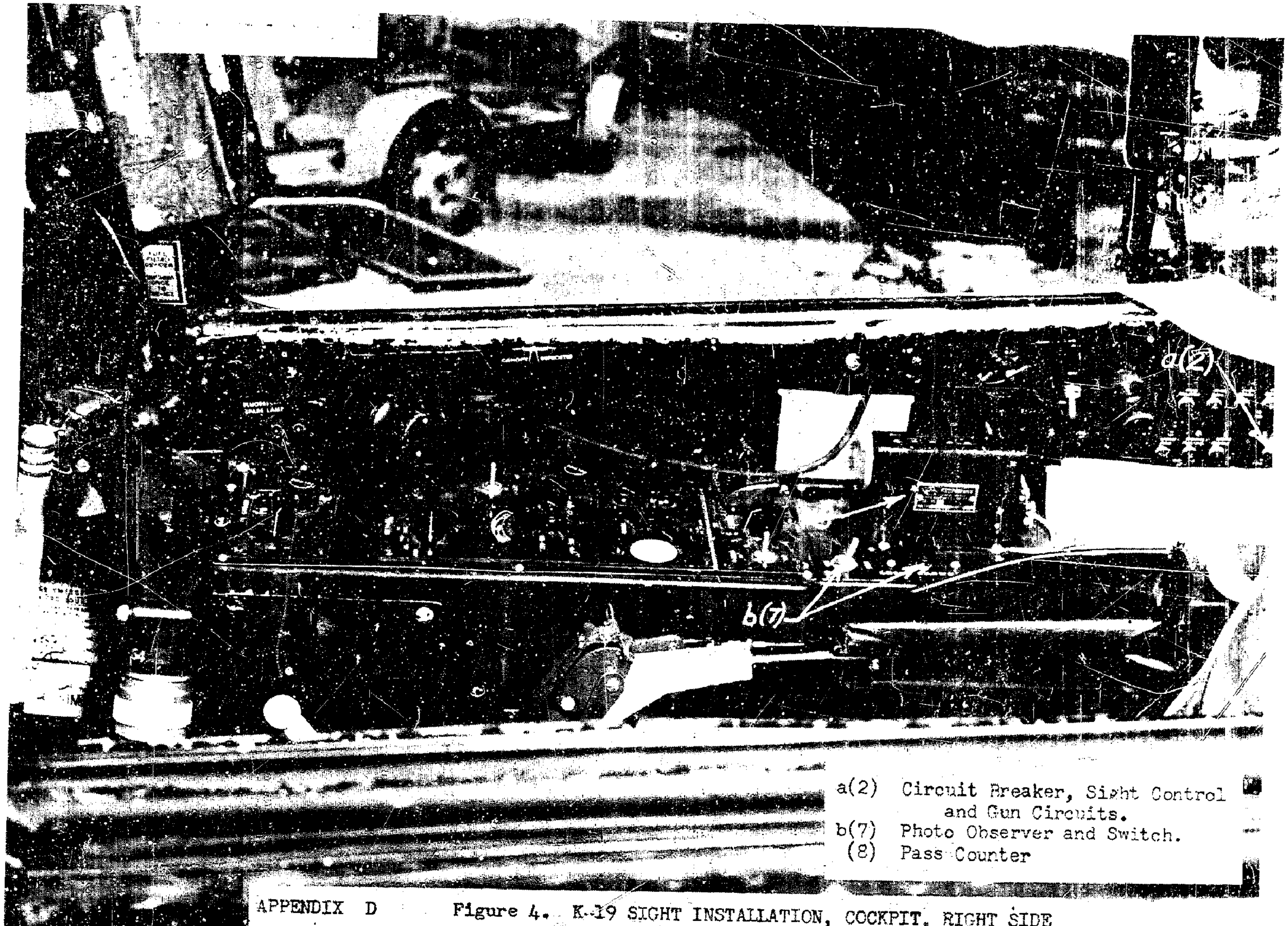
APPENDIX D Figure 1. K-19 SIGHT COMPONENTS



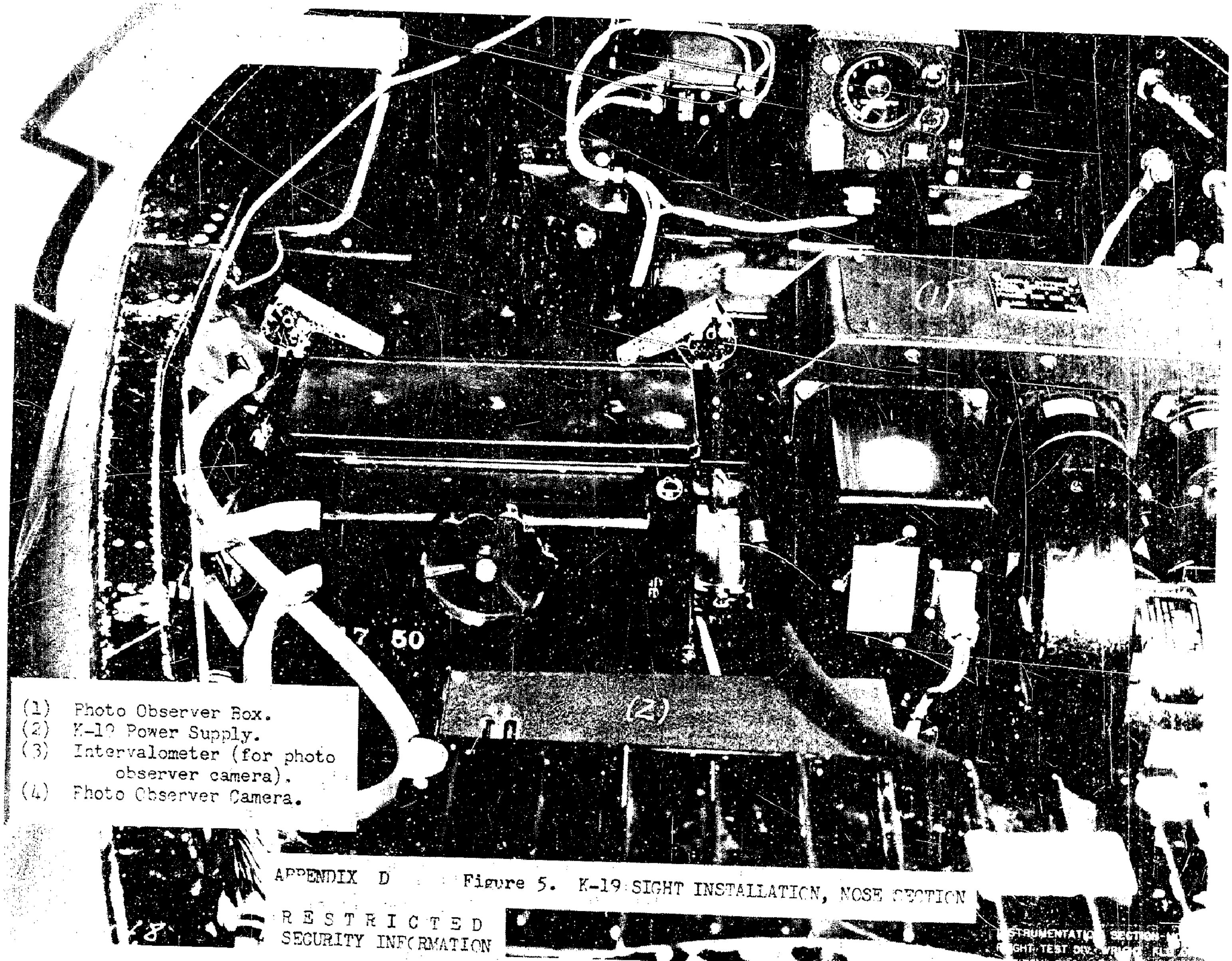
APPENDIX D Figure 2. K-19 SIGHT INSTALLATION, COCKPIT, LEFT SIDE



APPENDIX D Figure 3. K-19 SIGHT INSTALLATION, FRONT VIEW, COCKPIT



APPENDIX D Figure 4. K-19 SIGHT INSTALLATION, COCKPIT, RIGHT SIDE



(1) Photo Observer Box.
(2) K-19 Power Supply.
(3) Intervalometer (for photo observer camera).
(4) Photo Observer Camera.

APPENDIX D

Figure 5. K-19 SIGHT INSTALLATION, NOSE SECTION

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AIR PROVING GROUND, EGLIN AIR FORCE BASE, FLA. (PROJECT NO. ATD/FCB/3)

EXPERIMENTAL TEST AND EVALUATION OF THE K-19 GYRO COMPUTING SIGHT IN F-86A AIRPLANE, SERIAL NO. 48-295 - AND APPENDIXES A THRU C

EO 10501 dd 5 Nov 1953

10 DEC'51 31PP PHOTOS, DIAGRS, GRAPHS

GUN SIGHTS, COMPUTING
GUN SIGHTS, GYROSCOPIC
GUN SIGHTS - PERFORMANCE

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